PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-097938

(43)Date of publication of application : 11.04.1995

(51)Int.Cl. F02D 13/02
F01L 1/26
F01L 13/00
F02D 45/00

(21)Application number : 05-241722

(22)Date of filing : 28.09.1993

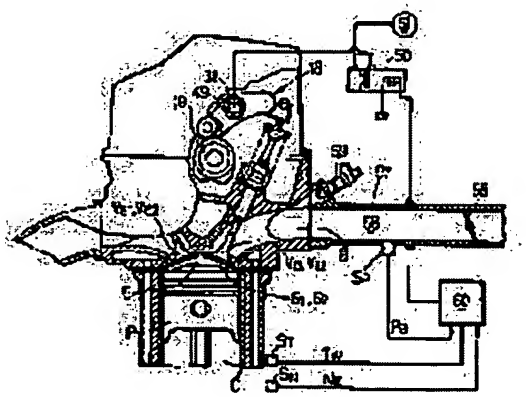
(71)Applicant : HONDA MOTOR CO LTD

(72)Inventor : MAEDA YOSHIO
MATSUKI MASATO

(54) INTERNAL COMBUSTION ENGINE

(57)Abstract:

PURPOSE: To prevent smoke from being generated in cooling of an engine by extending the engine speed of an internal combustion engine or load by which the two valve operating range or the one valve operating range is set to the decreasing side when a pair of intake valves are positioned in the two valve opearating range in the state where the temperature of the internal combustion engine is less than that at the time that warming-up is completed.



CONSTITUTION: A pair of intake valve ports 61, 62 opening to the ceiling surface of a combustion chamber 5 are communicated with a single intake opening end 8. Moreover both intake valve ports 61, 62 are individually opened and closed by a pair of intake valves V11, V12. And both intake valves V11, V12 are respectively switched by a valve system 18. In this case, the valve system 18 is controlled by a control means 60 through an electrically controlled valve 50 on the basis of respective detected signals by respective sensors SP. ST, SN for respectively detecting the driving state of the internal combustion engine. And the two valve operating range and the one valve opereating range are respectively set on the basis of the engine speed and the engine load, and the engine speed or the engine load are extended to the decreasing side in the two valve operating range in the state where the engine temperature is less than that at the time that warming-up is completed.

LEGAL STATUS

[Date of request for examination]	21.09.1999
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3313843
[Date of registration]	31.05.2002
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（A）　(11)特許出願公開番号

特開平7－97938

(43)公開日　平成７年(1995)４月11日

(51)Int.Cl.*	識別記号	庁内整理番号	ＦＩ	技術表示箇所
F02D 13/02		E		
		H		
F01L 1/26		B	6965-3G	
13/00	302	B		
F02D 45/00	310	Q		

審査請求　未請求　請求項の数２　ＯＬ　（全８頁）

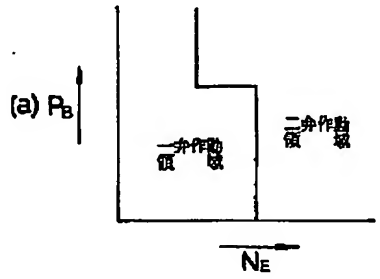
(21)出願番号　特願平5－241722

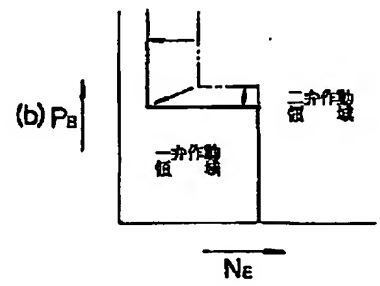
(22)出願日　平成５年(1993)９月28日

(71)出願人　000005326
本田技研工業株式会社
東京都港区南青山二丁目１番１号
(72)発明者　前田　義男
埼玉県和光市中央１丁目４番１号　株式会社本田技術研究所内
(72)発明者　松木　正人
埼玉県和光市中央１丁目４番１号　株式会社本田技術研究所内
(74)代理人　弁理士　落合　健　（外１名）

(54)【発明の名称】内燃機関

(57)【要約】
【目的】一対の吸気弁をともに開閉作動せしめる状態と、両吸気弁の一方を開閉作動せしめるが他方を実質的に休止させる状態とを切換可能な動弁装置を備える内燃機関において、機関温度が暖機温度未満の低温状態でのスモーク発生を防止する。
【構成】機関回転数および機関負荷の少なくとも一方に基づいて設定される二弁作動領域では両吸気弁をともに開閉作動せしめるが前記二弁作動領域以外の一弁作動領域では一方の吸気弁を開閉作動せしめるとともに他方の吸気弁を実質的に休止させるようにして動弁装置の作動が制御され、機関温度が暖機完了温度未満の状態での前記二弁作動領域は、暖機完了温度以上の状態に比べて前記機関回転数および機関負荷の少なくとも一方が低くなる側に拡大されて設定される。





【特許請求の範囲】

【請求項1】　一対の吸気弁（V_{11}，V_{12}）をともに開閉作動せしめる状態と、両吸気弁（V_{11}，V_{12}）の一方（V_{11}）を開閉作動せしめるが他方（V_{12}）を実質的に休止させる状態とを切換可能な動弁装置（18）を備える内燃機関において、機関回転数および機関負荷の少なくとも一方に基づいて設定される二弁作動領域では両吸気弁（V_{11}，V_{12}）をともに開閉作動せしめるが前記二弁作動領域以外の一弁作動領域では一方の吸気弁（V_{11}）を開閉作動せしめるとともに他方の吸気弁（V_{12}）を実質的に休止させるようにして動弁装置（18）の作動を制御する制御手段（60）を備え、機関温度が暖機完了温度未満の状態での前記二弁作動領域は、暖機完了温度以上の状態に比べて前記機関回転数および機関負荷の少なくとも一方が低くなる側に拡大されて設定されることを特徴とする内燃機関。

【請求項2】　前記動弁装置（18）は、両吸気弁（V_{11}，V_{12}）にそれぞれ個別に連動、連結されるロッカアーム（21，23）を含む複数のロッカアーム（21，22，23）と、油圧解放に応じてそれらのロッカアーム（21，22，23）を連結して両吸気弁（V_{11}，V_{12}）を開閉作動せしめる連結状態ならびに油圧作用に応じて前記ロッカアーム（21，22，23）の連結状態を解除して一方の吸気弁（V_{11}）を開閉作動せしめるが他方の吸気弁（V_{12}）を実質的に休止させる連結解除状態を切換可能な連結切換機構（41）とを備えることを特徴とする請求項1記載の内燃機関。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、一対の吸気弁をともに開閉作動せしめる状態と、両吸気弁の一方を開閉作動せしめるが他方を実質的に休止させる状態とを切換可能な動弁装置を備える内燃機関に関する。

【0002】

【従来の技術】従来、かかる内燃機関は、たとえば特開平4－203454号公報等により既に知られている。

【0003】

【発明が解決しようとする課題】ところで、一対の吸気弁のうち一方を開閉作動せしめるが他方を実質的に休止させる状態にすると、機関本体の燃焼室内にスワール流を生じせしめて希薄燃焼を可能とすることができるが、該スワール流により燃焼室内での燃料濃度分布は半径方向外方側に向かうにつれて濃くなって所謂層状給気となり、機関温度が低温であるとき、特に機関負荷が高いときにはスモークが発生する。このスモークは排気臭がある等の官能的な不快感を与えるだけでなく、機関潤滑油の劣化、ピストンクレビス部のカーボンデポジットの形成およびピストンリングスティックの原因ともなり、機関耐久性を損なう要因にもなる。しかるに、上記従来のものでは、機関温度にかかわらず機関回転数および機関負荷に基づいて二弁作動領域と一弁作動領域との境界値が一定に定められており、スモークの発生を防止することができない。

【0004】本発明は、かかる事情に鑑みてなされたものであり、機関温度が暖機温度未満の低温状態でのスモーク発生を防止した内燃機関を提供することを目的とする。

【0005】

【課題を解決するための手段】上記目的を達成するために、請求項1記載の発明は、一対の吸気弁をともに開閉作動せしめる状態と、両吸気弁の一方を開閉作動せしめるが他方を実質的に休止させる状態とを切換可能な動弁装置を備える内燃機関において、機関回転数および機関負荷の少なくとも一方に基づいて設定される二弁作動領域では両吸気弁をともに開閉作動せしめるが前記二弁作動領域以外の一弁作動領域では一方の吸気弁を開閉作動せしめるとともに他方の吸気弁を実質的に休止させるようにして動弁装置の作動を制御する制御手段を備え、機関温度が暖機完了温度未満の状態での前記二弁作動領域は、暖機完了温度以上の状態に比べて前記機関回転数および機関負荷の少なくとも一方が低くなる側に拡大されて設定されることを特徴とする。

【0006】また請求項2記載の発明によれば、上記請求項1記載の発明の構成に加えて、動弁装置は、両吸気弁にそれぞれ個別に連動、連結される駆動ロッカアームを含む複数のロッカアームと、油圧解放に応じてそれらのロッカアームを連結して両吸気弁を開閉作動せしめる連結状態ならびに油圧作用に応じて前記ロッカアームの連結状態を解除して一方の吸気弁を開閉作動せしめるが他方の吸気弁を実質的に休止させる連結解除状態を切換可能な連結切換機構とを備える。

【0007】

【実施例】以下、図面により本発明の一実施例について説明する。

【0008】図1ないし図6は本発明の一実施例を示すものであり、図1は全体構成図、図2は動弁装置を示す拡大縦断面図、図3は図2の3－3線矢視図、図4は図3の4－4線断面図、図5は動弁装置の制御手順を示すフローチャート、図6は弁作動領域マップを示す図である。

【0009】先ず図1および図2において、SOHC型多気筒内燃機関における機関本体の主要部を構成すべく、シリンダブロック1の上面にシリンダヘッド2が結合され、シリンダブロック1に設けられた複数のシリンダCにはピストンPが摺動可能にそれぞれ嵌合され、それらのピストンPの上面およびシリンダヘッド2間に燃焼室5がそれぞれ形成される。

【0010】燃焼室5の天井面に開口するようにして、一対の吸気弁口6_1，6_2と一対の排気弁口7_1，7_2とがシリンダヘッド2に設けられており、両吸気弁口6

$_1$，6$_2$は、シリンダヘッド２の一側面に開口する単一の吸気開口端８に、相互間に隔壁２ａを挟んだ吸気ポート9$_1$，9$_2$を介して連なり、両排気弁口7$_1$，7$_2$は、シリンダヘッド２の他側面に開口する単一の排気開口端１０に、相互間に隔壁２ｂを挟んだ排気ポート１1$_1$，１1$_2$を介して連なる。また両吸気弁口6$_1$，6$_2$を個別に開閉可能な一対の吸気弁V_{I1}，V_{I2}は、シリンダヘッド２に配設された一対のガイド筒１２にそれぞれ摺動可能に嵌合されており、各ガイド筒１２から突出した各吸気弁V_{I1}，V_{I2}の上端部にそれぞれ固定されたリテーナ１３とシリンダヘッド２との間には各吸気弁V_{I1}，V_{I2}を囲繞するコイル状の弁ばね１４がそれぞれ介設され、それらの弁ばね１４により各吸気弁V_{I1}，V_{I2}は上方すなわち閉弁方向に付勢される。さらに両排気弁口7$_1$，7$_2$を個別に開閉可能な一対の排気弁V_{E1}，V_{E2}は、シリンダヘッド２に配設された一対のガイド筒１５にそれぞれ摺動可能に嵌合されており、各ガイド筒１５から突出した各排気弁V_{E1}，V_{E2}の上端部にそれぞれ固定されたリテーナ１６とシリンダヘッド２との間には各排気弁V_{E1}，V_{E2}を囲繞するコイル状の弁ばね１７がそれぞれ介設され、それらの弁ばね１７により各排気弁V_{E1}，V_{E2}は上方すなわち閉弁方向に付勢される。

【００１１】図３を併せて参照して、両吸気弁V_{I1}，V_{I2}および両排気弁V_{E1}，V_{E2}には動弁装置１８が連結される。この動弁装置１８は、図示しないクランクシャフトに１／２の減速比で連動、連結される単一のカムシャフト１９と、カムシャフト１９の回転運動を両吸気弁V_{I1}，V_{I2}の開閉運動に変換するための第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３と、前記カムシャフト１９の回転運動を両排気弁V_{E1}，V_{E2}の開閉運動に変換するための第１および第２排気側ロッカアーム２４，２５とを備える。

【００１２】カムシャフト１９は、シリンダヘッド２と、前記クランクシャフトの軸線に沿うシリンダ３の両側で該シリンダヘッド２上にそれぞれ結合されるホルダ２６…とで、シリンダ３の軸線と直交する水平な軸線を有しながら回転自在に支承される。

【００１３】図４において、カムシャフト１９には、機関の低速運転に対応した形状の第１吸気側カム２７と、機関の高速運転に対応した形状に形成されながら第１吸気側カム２７の一側に隣接配置される第２吸気側カム２８と、第２吸気側カム２８の一側に隣接する隆起部２９とが一体に設けられるとともに、第１吸気側カム２７および隆起部２９の両側に排気側カム３０，３０が一体に設けられる。前記隆起部２９は、機関の低負荷運転域で両吸気弁V_{I1}，V_{I2}の一方V_{I2}を実質的に休止状態とすべく基本的にはカムシャフト１９の軸線を中心とする円形の外面を有するように形成されるものであるが、第１および第２吸気側カム２７，２８の高位部に対応する位置にはわずかに突出した突部が設けられている。しかもカムシャフト１９の軸線に沿う方向での該隆起部２９の幅は比較的狭く設定される。

【００１４】一方の吸気弁V_{I1}には第１駆動ロッカアーム２１が連動、連結され、他方の吸気弁V_{I2}には第２駆動ロッカアーム２３が連動、連結され、両吸気弁V_{I1}，V_{I2}に対して自由となり得る自由ロッカアーム２２が第１および第２駆動ロッカアーム２１，２３間に配置される。而して第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３は、カムシャフト１９の斜め上方位置で該カムシャフト１９と平行な軸線を有しながらホルダ２６…に固定的に支持された吸気側ロッカシャフト３１で揺動自在に支承される。また第１および第２排気側ロッカアーム２４，２５は、両排気弁V_{E1}，V_{E2}に個別に連動、連結されており、前記カムシャフト１９の斜め上方位置で前記吸気側ロッカシャフト３１と平行にしてホルダ２６…に固定的に支持された排気側ロッカシャフト３２に揺動自在に支承される。

【００１５】第１駆動ロッカアーム２１の一端には第１吸気側カム２７に転がり接触するローラ３３が軸支され、第２駆動ロッカアーム２３の一端には隆起部２９に摺接する摺接部３４が隆起部２９に対応して幅を狭くしながら設けられ、自由ロッカアーム２２には第２吸気側カム２８に摺接するカムスリッパ３５が設けられる。また両排気側ロッカアーム２４，２５の一端には、カムシャフト１９に設けられた排気側カム３０，３０に転がり接触するローラ３６がそれぞれ軸支される。

【００１６】第１および第２駆動ロッカアーム２１，２３の他端には、両吸気弁V_{I1}，V_{I2}の上端に当接するタペットねじ３７がそれぞれ進退自在に螺合されており、第１および第２駆動ロッカアーム２１，２３の揺動作動に応じて各吸気弁V_{I1}，V_{I2}が開閉作動することになる。また両排気側ロッカアーム２４，２５の他端には、各排気弁V_{E1}，V_{E2}の上端に当接するタペットねじ３８がそれぞれ進退自在に螺合されており、両排気側ロッカアーム２４，２５の揺動作動に応じて各排気弁V_{E1}，V_{E2}が開閉作動することになる。

【００１７】ところで、各ホルダ２６…の上端間には支持板３９が架設されており、この支持板３９には、自由ロッカアーム２２をカムシャフト１９の第２吸気側カム２８に摺接させる方向に弾発付勢するロストモーション機構４０が配設される。

【００１８】第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３には、それらのロッカアーム２１～２３の連結状態と、それらのロッカアーム２１～２３の連結解除状態とを、機関の運転状態に応じて切換可能な連結切換機構４１が設けられる。

【００１９】この連結切換機構４１は、第１駆動ロッカアーム２１に摺動可能に嵌合される切換ピストン４２と、第１駆動ロッカアーム２１および自由ロッカアーム２２を連結可能な第１連結ピン４３と、自由ロッカアー

ム２２および第２駆動ロッカアーム２３を連結可能な第２連結ピン４４と、第２連結ピン４４および第２駆動ロッカアーム２３間に縮設されるばね４５とを備える。

【００２０】第１駆動ロッカアーム２１には、自由ロッカアーム２２側に開放した有底の第１ガイド穴４６が吸気側ロッカシャフト３１と平行に穿設されており、この第１ガイド穴４６に切換ピストン４２が摺動可能に嵌合され、切換ピストン４２の一端と第１ガイド穴４６の閉塞端との間に油圧室４７が画成される。また第１駆動側ロッカアーム２１には油圧室４７に連通する連通路４８が穿設され、吸気側ロッカシャフト３１内には、第１駆動ロッカアーム２１の揺動状態にかかわらず前記連通路４８すなわち油圧室４７に常時連通する油路４９が設けられる。而して該油路４９は、図１で示すように、連結切換用電磁制御弁５０を介して油圧源５１に接続される。

【００２１】自由ロッカアーム２２には、第１ガイド穴４６に対応するガイド孔５２が吸気側ロッカシャフト３１と平行にして両側面間にわたって穿設されており、前記切換ピストン４２の他端に一端が当接される第１連結ピン４３がガイド孔５２に摺動可能に嵌合される。

【００２２】第２駆動ロッカアーム２３には、前記ガイド孔５２に対応する有底の第２ガイド穴５３が自由ロッカアーム２２側に開放するとともに自由ロッカアーム２２側に臨む段部５３ａを有して吸気側ロッカシャフト３１と平行に穿設されており、第１連結ピン４３の他端に一端を当接させた有底円筒状の第２連結ピン４４が前記段部５３ａに他端を当接させ得るようにして第２ガイド穴５３に摺動可能に嵌合される。この第２連結ピン４４は、その開口端を第２ガイド穴５３の閉塞端側に向けて配置されるものであり、ばね４５は、第２ガイド穴５３の閉塞端および第２連結ピン４４の閉塞端間に縮設される。しかも第２ガイド穴５３の閉塞端には、空気および油抜き用の連通孔５４が穿設される。

【００２３】かかる連結切換機構４１において、連結切換用電磁制御弁５０により油圧室４７に油圧を作用せしめると、切換ピストン４２はばね４５のばね力に抗して油圧室４７の容積を増大する側に移動し、第２連結ピン４４は段部５３ａに当接することにより移動端が規制される。この状態で、切換ピストン４２および第１連結ピン４３の当接面は第１駆動ロッカアーム２１および自由ロッカアーム２２間に対応する位置に在り、第１連結ピン４３および第２連結ピン４４の当接面は自由ロッカアーム２２および第２駆動ロッカアーム２３間に対応する位置に在る。したがって第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３は相互に相対角変位可能な状態にあり、カムシャフト１９の回転作動により第１駆動ロッカアーム２１は第１吸気側カム２７によって揺動駆動され、一方の吸気弁V_{I1}は第１吸気側カム２７の形状に応じたタイミングおよびリフト量で開閉作動する。また隆起部２９に摺接した第２駆動ロッカアーム２３は実質的に休止状態となり、他方の吸気弁V_{I2}を実質的に休止させることができる。しかも吸気弁V_{I2}は完全に休止するのではなく、一方の吸気弁V_{I1}が開弁するときには開弁方向にわずかに作動するので、完全な閉弁状態を保ったときに生じる吸気弁V_{I2}の弁座への固着および燃料の滞留を防止することができる。さらに自由ロッカアーム２２は第２吸気側カム２８によって揺動駆動されるが、その揺動動作は第１および第２駆動ロッカアーム２１，２３に何らの影響も及ぼさない。また排気弁V_{E1}，V_{E2}は排気側カム３０，３０の形状に応じたタイミングおよびリフト量で開閉作動する。

【００２４】連結切換用電磁制御弁５０により油圧室４７の油圧を解放すると、第１ガイド穴４６、ガイド孔５２および第２ガイド穴５３の軸線が一致したときに、ばね４５のばね力により、第２連結ピン４４は第１連結ピン４３を押圧しながらガイド孔５２に嵌合し、第１連結ピン４３は切換ピストン４２を押圧しながら第１ガイド穴４６に嵌合する。而して切換ピストン４２が第１ガイド穴４６の閉塞端により移動を規制された状態で第１連結ピン４３は第１駆動ロッカアーム２１および自由ロッカアーム２２を連結し、第２連結ピン４４は自由ロッカアーム２２および第２駆動ロッカアーム２３を連結することになる。これにより、第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３が連結状態となり、第２吸気側カム２８によって揺動駆動される自由ロッカアーム２２とともに第１および第２駆動ロッカアーム２１，２３が揺動し、両吸気弁V_{I1}，V_{I2}はともに第２吸気側カム２８の形状に応じたタイミングおよびリフト量で開閉作動せしめられる。また両排気側ロッカアーム２４，２５は、低負荷時と同様に排気側カム３０，３０の形状に応じたタイミングおよびリフト量で両排気弁V_{E1}，V_{E2}を開閉作動せしめる。

【００２５】すなわち、連結切換機構４１は、第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３を油圧解放に応じて連結して両吸気弁V_{I1}，V_{I2}を開閉作動せしめる連結状態と、第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３の連結状態を油圧作用に応じて解除して一方の吸気弁V_{I1}を開閉作動せしめるが他方の吸気弁V_{I2}を実質的に休止させる連結解除状態とを切換可能に構成される。

【００２６】再び図１において、吸気開口端８には、吸気通路５６を形成する吸気管５７が接続されており、該吸気通路５６の途中にはスロットル弁５８が介設される。また吸気管５７におけるシリンダヘッド２側の端部には、吸気開口端８から両吸気弁口6_1，6_2に向けて燃料を噴射する燃料噴射弁５９が取付けられる。

【００２７】動弁装置１８の作動状態を切換えるための

前記連結切換用電磁制御弁５０の作動は、コンピュータから成る制御手段６０により制御されるものであり、該制御手段６０には、機関負荷を代表する指標としての吸気圧力P_Bを検出する吸気圧力センサS_P、機関回転数N_Eを検出する回転数センサS_Eで検出される機関回転数N_E、ならびに機関温度T_Wを検出する機関温度センサS_Tがそれぞれ接続される。

【００２８】而して、連結切換用電磁制御弁５０の作動すなわち動弁装置１８の切換作動を制御するために、制御手段６０で設定されている制御手順について図５を参照しながら説明すると、第１ステップＳ１および第２ステップＳ２で、吸気圧力P_B、機関回転数N_Eおよび機関温度T_Wを読み込んだ後の第３ステップＳ３では、機関温度T_Wが暖機完了温度$T_{W,cr}$（たとえば６０度C）以上であるか否かが判断され、$T_{W,cr} \leqq T_W$であったときには第４ステップＳ４に進む。

【００２９】第４ステップＳ４では、図６（ａ）で示すマップによる検索が実行される。すなわち機関回転数N_Eおよび吸気圧力P_Bに基づいて、両吸気弁V_{I1}，V_{I2}をともに開閉作動せしめるための二弁作動領域と、一方の吸気弁V_{I1}を開閉作動せしめるが他方の吸気弁V_{I2}を実質的に休止せしめる一弁作動領域とが予め設定されており、検出された機関回転数N_Eおよび吸気圧力P_Bによる図６（ａ）のマップに基づく検索が実行される。

【００３０】次の第５ステップＳ５で一弁作動領域に在ると判断されたときには、第６ステップＳ６において、動弁装置１８における連結切換機構４１の油圧室４７に油圧を作用させて、第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３を連結解除状態とし、一方の吸気弁V_{I1}を開閉作動せしめるが他方の吸気弁V_{I2}を実質的に休止させるようにする。また第５ステップＳ５で二弁作動領域であると判断されたときには、第７ステップＳ７において、前記連結切換機構４１の油圧室４７から油圧を解放させて、第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３を連結状態とし、両吸気弁V_{I1}，V_{I2}をともに開閉作動せしめるようにする。

【００３１】第３ステップＳ３で、機関温度T_Wが暖機完了温度$T_{W,cr}$未満（$T_W < T_{W,cr}$）であると判断されたときには、第３ステップＳ３から第８ステップＳ８に進む。この第８ステップＳ８では、図６（ｂ）で示すマップによる検索が実行される。すなわち機関回転数N_Eおよび吸気圧力P_Bに基づいて、両吸気弁V_{I1}，V_{I2}をともに開閉作動せしめるための二弁作動領域と、一方の吸気弁V_{I1}を開閉作動せしめるが他方の吸気弁V_{I2}を実質的に休止せしめる一弁作動領域とが予め設定されるが、この図６（ｂ）で示すマップにおける二弁作動領域は、鎖線で示す図６（ａ）のマップに比べて、高負荷側において機関回転数N_Eおよび吸気圧力P_Bのいずれもが低くなる側に拡大されて設定されている。

【００３２】第９ステップＳ９で、図６（ｂ）のマップ検索により一弁作動領域に在ると判断されたときには、第１０ステップＳ１０に進み、動弁装置１８における連結切換機構４１の油圧室４７に油圧を作用させて、第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３を連結解除状態とし、一方の吸気弁V_{I1}を開閉作動せしめるが他方の吸気弁V_{I2}を実質的に休止させるようにする。また第９ステップＳ９で二弁作動領域であると判断されたときには、第７ステップＳ７に進み、前記連結切換機構４１の油圧室４７から油圧を解放させて、第１駆動ロッカアーム２１、自由ロッカアーム２２および第２駆動ロッカアーム２３を連結状態とし、両吸気弁V_{I1}，V_{I2}をともに開閉作動せしめるようにする。

【００３３】次にこの実施例の作用について説明すると、制御手段６０は、機関負荷を代表する吸気圧力P_Bおよび機関回転数N_Eに基づいて二弁作動領域にあると判断したときには両吸気弁V_{I1}，V_{I2}をともに開閉作動せしめ、一弁作動領域では一方の吸気弁V_{I1}を開閉作動せしめるとともに他方の吸気弁V_{I2}を実質的に休止させるように動弁装置１８の作動を制御するが、前記他方の吸気弁V_{I2}を実質的に休止させることにより燃焼室５内でスワール流を生じさせて希薄燃焼を行なうようにしたときに、暖機が完了する前の機関温度T_Wが低温である状態で特に機関負荷が高い場合には、層状給気に起因してスモークが発生する。しかるに、機関温度T_Wが暖機完了温度$T_{W,cr}$未満の状態での二弁作動領域は、図６（ｂ）で示したように、図６（ａ）で示す暖機完了温度以上の状態に比べて、高負荷側において機関回転数N_Eおよび吸気圧力P_Bのいずれもが低くなる側に拡大されるものである。したがって暖機完了温度以上の状態では吸気弁V_{I2}を実質休止させる一弁作動を実行する高負荷時において、暖機完了温度未満の状態では、両吸気弁V_{I1}，V_{I2}をともに開閉作動させることにより燃焼室５内では均質混合気が形成されることになり、スモークの発生が極力防止され、それにより機関耐久性の向上に寄与することができる。

【００３４】しかも連結切換機構４１は、油圧解放に応じて両吸気弁V_{I1}，V_{I2}を開閉作動せしめ、油圧作用に応じて一方の吸気弁V_{I1}を開閉作動せしめるが他方の吸気弁V_{I2}を実質的に休止させるようにするものであり、切換応答性の上で問題が生じる極低油温時でも、両吸気弁V_{I1}，V_{I2}をともに開閉作動せしめて高出力を得ることが可能となる。

【００３５】以上、本発明の実施例を詳述したが、本発明は上記実施例に限定されるものではなく、特許請求の範囲に記載された本発明を逸脱することなく種々の設計変更を行なうことが可能である。

【００３６】たとえば、二弁作動領域および一弁作動領域は、機関回転数および機関負荷の少なくとも一方に基

づいて設定されるものであればよい。また上記実施例では、吸気弁V_{12}を完全には休止させず、一方の吸気弁V_{11}が開弁するときには開弁方向にわずかに作動させるようにしたが、前記吸気弁V_{11}を完全に休止させるようにしたものに関しても本発明を適用することができる。

【００３７】

【発明の効果】以上のように請求項１記載の発明に従う内燃機関は、機関回転数および機関負荷の少なくとも一方に基づいて設定される二弁作動領域では両吸気弁をともに開閉作動せしめるが前記二弁作動領域以外の一弁作動領域では一方の吸気弁を開閉作動せしめるとともに他方の吸気弁を実質的に休止させるようにして動弁装置の作動を制御する制御手段を備え、機関温度が暖機完了温度未満の状態での前記二弁作動領域は、暖機完了温度以上の状態に比べて前記機関回転数および機関負荷の少なくとも一方が低くなる側に拡大されて設定されるので、暖機完了温度以上のときには一弁を休止させる状態であっても、暖機完了温度未満では一対の吸気弁をともに開閉作動させるようにして均質混合気を得ることによりスモークの発生を極力防止し、機関耐久性の向上に寄与することができる。

【００３８】また請求項２記載の発明によれば、上記請求項１記載の発明の構成に加えて、動弁装置は、両吸気弁にそれぞれ個別に連動、連結される駆動ロッカアームを含む複数のロッカアームと、油圧解放に応じてそれらのロッカアームを連結して両吸気弁を開閉作動せしめる連結状態ならびに油圧作用に応じて前記ロッカアームの連結状態を解除して一方の吸気弁を開閉作動せしめるが他方の吸気弁を実質的に休止させる連結解除状態を切換可能な連結切換機構とを備えるものであり、切換応答性の上で問題が生じる極低油温時でも、両吸気弁をともに開閉作動せしめて高出力を得ることが可能となる。

【図面の簡単な説明】

【図１】全体構成図である。

【図２】動弁装置を示す拡大縦断面図である。

【図３】図２の３－３線矢視図である。

【図４】図３の４－４線断面図である。

【図５】動弁装置の制御手順を示すフローチャートである。

【図６】弁作動領域マップを示す図である。

【符号の説明】

１８・・・動弁装置

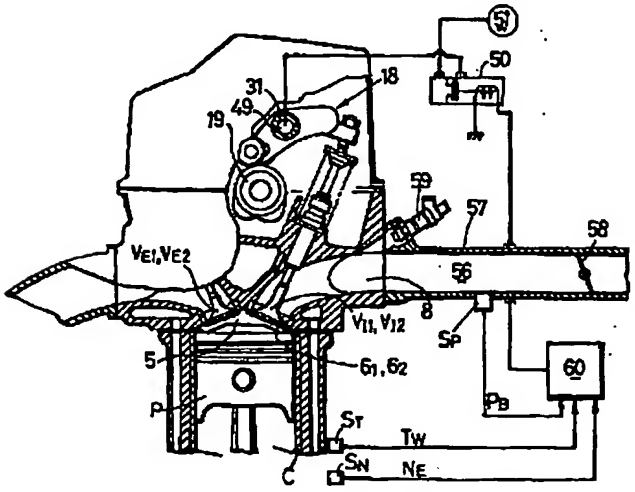
２１，２２，２３・・・ロッカアーム

４１・・・連結切換機構

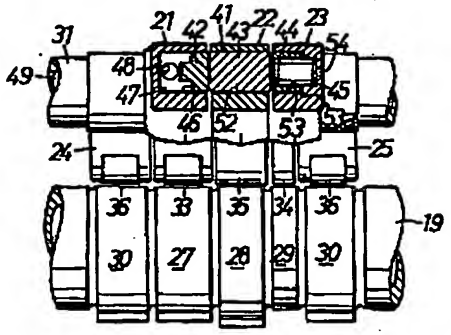
６０・・・制御手段

V_{11}，V_{12}・・・吸気弁

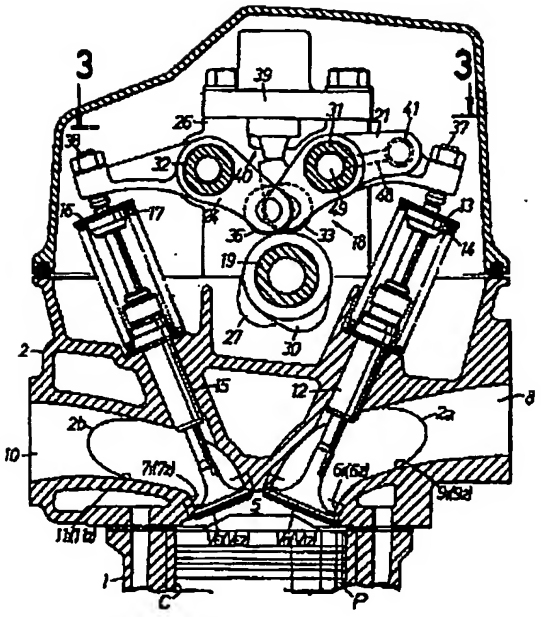
【図１】



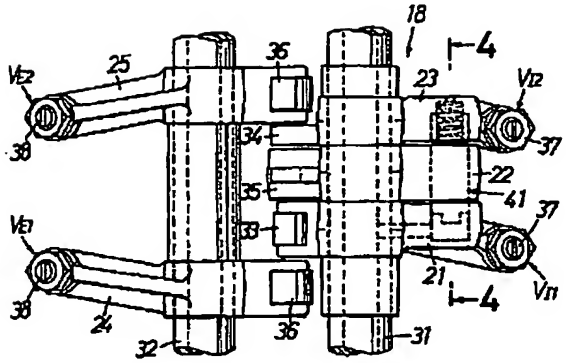
【図４】



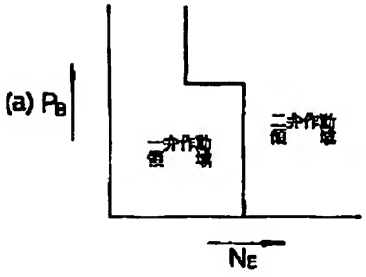
【図2】

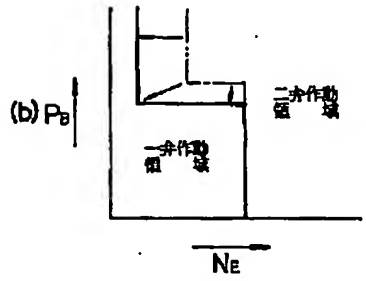


【図3】



【図6】





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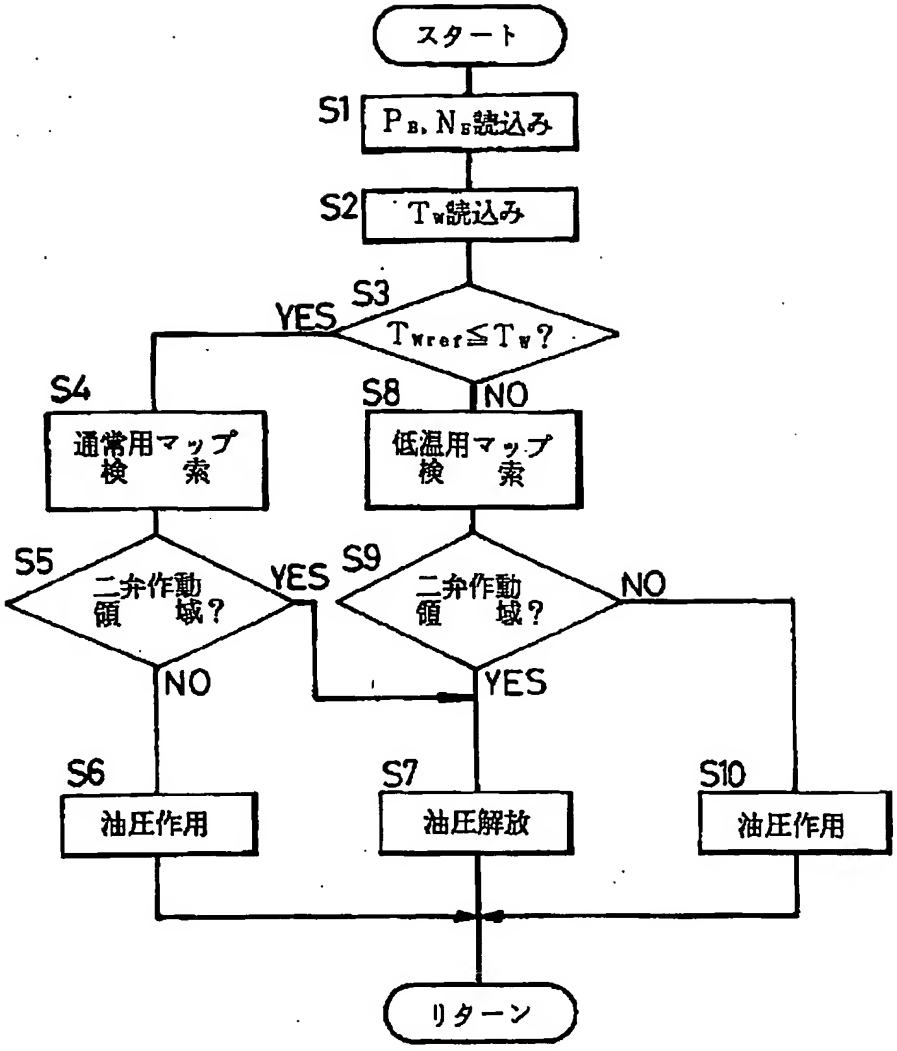
スタート
S1
P_B, N_B読込み
S2
T_W読込み
S3
YES
$T_{wref} \leqq T_W$?
NO
S4
通常用マップ検索
S8
低温用マップ検索
S5
二弁作動領域?
YES
S9
二弁作動領域?
NO
NO
YES
S6
油圧作用
S7
油圧解放
S10
油圧作用
リターン

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The condition of carrying out closing motion actuation of both the inlet valves (VI1, VI2) of a couple, In the internal combustion engine which has a switchable moving valve mechanism (18) for the condition of stopping another side (VI2) substantially although both inlet valves (VI1, VI2) carry out closing motion actuation on the other hand (VI1) Although closing motion actuation of both the inlet valves (VI1, VI2) is carried out in both the 2 valve operating spaces set up based on either [at least] an engine rotational frequency or an engine load, while carrying out closing motion actuation of one inlet valve (VI1) in 1 valve operating spaces other than said 2 valve operating space It has the control means (60) which controls actuation of a moving valve mechanism (18) as is made to stop the inlet valve (VI2) of another side substantially. For said 2 valve operating space in the condition of under the completion temperature of warming-up, engine temperature is the internal combustion engine with which it is characterized by expanding and setting either [at least] said engine rotational frequency or an engine load to the side which becomes low compared with the condition beyond the completion temperature of warming-up.
[Claim 2] Two or more rocker arms containing the rocker arm (21 23) which said moving valve mechanism (18) is interlocked with both inlet valves (VI1, VI2) according to an individual, respectively, and is connected (21, 22, 23), According to oil pressure release, those rocker arms (21, 22, 23) are connected. According to the connection condition and oil pressure operation which carry out closing motion actuation of both the inlet valves (VI1, VI2), the connection condition of said rocker arm (21, 22, 23) is canceled. The internal combustion engine according to claim 1 characterized by having a switchable connection change-over device (41) for the deconcatenation condition of stopping the inlet valve (VI2) of another side substantially although closing motion actuation of one inlet valve (VI1) is carried out.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Both this inventions relate the condition of carrying out closing motion actuation of the inlet valve of a couple, and the condition of stopping another side substantially although closing motion actuation of one side of both inlet valves is carried out to the internal combustion engine having a switchable moving valve mechanism.
[0002]
[Description of the Prior Art] Conventionally, this internal combustion engine is already known by JP,4-203454,A etc.
[0003]
[Problem(s) to be Solved by the Invention] By the way, although it can produce and cheat out of a swirl style to the combustion chamber of an engine body and lean combustion can be made possible if another side is changed into the condition of making it stopping substantially, although closing motion actuation of one side is carried out among the inlet valves of a couple It becomes deep and becomes the so-called stratified charge as the fuel concentration distribution by the combustion chamber goes to the method side of the outside of radial by this swirl style, and when engine temperature is low temperature, and especially an engine load is expensive, a smoke occurs. This smoke causes degradation of an engine lubricating oil, formation of the carbon deposit of the piston clevis section, and a piston ring stick, and it not only gives sensuous displeasure, like there is an exhaust air smell, but becomes the factor which spoils engine endurance. However, in the above-mentioned conventional thing, irrespective of engine temperature, based on the engine rotational frequency and the engine load, the boundary value of a 2 valve operating space and a 1 valve operating space is defined uniformly, and generating of a smoke cannot be prevented.
[0004] This invention is made in view of this situation, and aims to let engine temperature offer the internal combustion engine which prevented smoked generating in the low-temperature condition of under warming-up temperature.
[0005]
[Means for Solving the Problem] In order to attain the above-mentioned object, invention according to claim 1 In the internal combustion engine which has a switchable moving valve mechanism for the condition of carrying out closing motion actuation of both the inlet valves of a couple, and the condition of stopping another side substantially although closing motion actuation of one side of both inlet valves is carried out Although closing motion actuation of both the inlet valves is carried out in both the 2 valve operating spaces set up based on either [at least] an engine rotational frequency or an engine load, while carrying out closing motion actuation of one inlet valve in 1 valve operating spaces other than said 2 valve operating space It has the control means which controls actuation of a moving valve mechanism as is made to stop the inlet valve of another side substantially. Engine temperature said 2 valve operating space in the condition of under the completion temperature of warming-up It is characterized by being expanded and set to the side to which either [at least] said engine rotational frequency or an engine load becomes low compared with the condition beyond the completion temperature of warming-up.
[0006] According to invention according to claim 2, in the configuration of invention of the claim 1 above-mentioned publication moreover, in addition, a moving valve mechanism Two or more rocker arms containing the actuation rocker arm which it interlocks according to an individual to both inlet valves, and is connected with them, respectively, The connection condition of said rocker arm is canceled according to the connection condition and oil pressure operation which those rocker arms are connected [operation] according to oil pressure release, and carry out closing motion actuation of both the inlet valves. Although closing motion actuation of one inlet valve is carried out, it has a

switchable connection change-over device for the deconcatenation condition of stopping the inlet valve of another side substantially.

[0007]

[Example] Hereafter, a drawing explains one example of this invention.

[0008] The enlarged vertical longitudinal sectional view in which drawing 1 thru/or drawing 6 show one example of this invention, drawing 1 shows a whole block diagram, and drawing 2 shows a moving valve mechanism, the flow chart with which in drawing 3 3-3 line view drawing of drawing 2 and drawing 4 show the 4-4 line sectional view of drawing 3 , and drawing 5 shows the control procedure of a moving valve mechanism, and drawing 6 are drawings showing a valve operating-space map.

[0009] First, the cylinder head 2 is combined with the top face of a cylinder block 1, fitting of the sliding of Piston P is made possible to two or more cylinders C prepared in the cylinder block 1 in drawing 1 and drawing 2 , respectively that the body of the engine body in a SOHC mold Taki cylinder internal combustion engine should be constituted, and a combustion chamber 5 is formed between the top face of those pistons P, and the cylinder head 2, respectively.

[0010] the head-lining side of a combustion chamber 5 -- opening -- carrying out -- making -- the inlet-valve opening 61 of a couple, and 62 The exhaust valve opening 71 of a couple, and 72 it prepares in the cylinder head 2 -- having -- **** -- both the inlet-valves opening 61 and 62 The inlet port 91 which inserted septum 2a into the single inhalation-of-air opening edge 8 which carries out opening to one side face of the cylinder head 2 mutually, and 92 It minds and stands in a row. Both the exhaust valve opening 71 and 72 The exhaust port 111 which inserted septum 2b into the single exhaust air opening edge 10 which carries out opening to the other side faces of the cylinder head 2 mutually, and 112 It minds and stands in a row. Moreover, both inlet-valves openings 61 and 62 The inlet valves VI1 and VI2 of the couple which can be opened and closed according to an individual Fitting of the sliding is made respectively possible to the guide cylinder 12 of the couple arranged by the cylinder head 2. Between the retainers 13 and the cylinder heads 2 which were fixed to the upper bed section of each inlet valves VI1 and VI2 which projected from each guide cylinder 12, respectively, the coiled form valve spring 14 which surrounds each inlet valves VI1 and VI2 is interposed, respectively. Each inlet valves VI1 and VI2 are energized in the upper part of clausilium, i.e., the direction, by those valve springs 14. Furthermore, it is both the exhaust valve opening 71 and 72. The exhaust valves VE1 and VE2 of the couple which can be opened and closed according to an individual Fitting of the sliding is made respectively possible to the guide cylinder 15 of the couple arranged by the cylinder head 2. Between the retainers 16 and the cylinder heads 2 which were fixed to the upper bed section of each exhaust valves VE1 and VE2 which projected from each guide cylinder 15, respectively, the coiled form valve spring 17 which surrounds each exhaust valves VE1 and VE2 is interposed, respectively. Each exhaust valves VE1 and VE2 are energized in the upper part of clausilium, i.e., the direction, by those valve springs 17.

[0011] Drawing 3 is referred to collectively and a moving valve mechanism 18 is connected with both the inlet valves VI1 and VI2 and both the exhaust valves VE1 and VE2. This moving valve mechanism 18 is equipped with the single cam shaft 19 which it interlocks and is connected with the crankshaft which is not illustrated with one half of reduction gear ratios, the 1st actuation rocker arm 21 for changing rotation of a cam shaft 19 into the opening and closing movement of both the inlet valves VI1 and VI2, the free rocker arm 22 and the 2nd actuation rocker arm 23, and the 1st and 2nd exhaust side rocker arms 24 and 25 for changing rotation of said cam shaft 19 into the opening and closing movement of both the exhaust valves VE1 and VE2.

[0012] A cam shaft 19 is with the cylinder head 2 and holder 26 -- combined on this cylinder head 2 on both sides of the cylinder 3 which meets the axis of said crankshaft, respectively, and it is supported free [a revolution], having the axis of a cylinder 3, and the level axis which intersects perpendicularly.

[0013] The 1st inspired air flow path cam 27 of the configuration on drawing 4 and corresponding to an engine's low r.p.m. operation in a cam shaft 19, While the 2nd inspired air flow path cam 28 by which contiguity arrangement is carried out at the 1 side of the 1st inspired air flow path cam 27, and the ridge 29 which adjoins the 1 side of the 2nd inspired air flow path cam 28 are formed in one, being formed in the configuration corresponding to high-speed operation of an engine The exhaust side cams 30 and 30 are formed in the both sides of the 1st inspired air flow path cam 27 and a ridge 29 at one. Although it is formed so that said ridge 29 may have the circular outside surface of both the inlet valves VI1 and VI2 centering on the axis of a cam shaft 19 fundamentally in an engine's low-load-driving region that VI2 should be substantially made hibernation on the other hand, the projected part which projected slightly is prepared in the location corresponding to the high order section of the 1st and 2nd inspired air flow path cams 27 and

28. And the width of face of this ridge 29 in the direction which meets the axis of a cam shaft 19 is set up comparatively narrowly.

[0014] The 1st actuation rocker arm 21 interlocks and is connected with one inlet valve VI 1, the 2nd actuation rocker arm 23 interlocks, and is connected with the inlet valve VI 2 of another side, and the free rocker arm 22 which can become free to both the inlet valves VI1 and VI2 is arranged between the 1st and 2nd actuation rocker arm 21 and 23. It **, and the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 are supported free [a splash] by the inspired air flow path rocker shaft 31 supported by holder 26 -- fixed, having an axis parallel to this cam shaft 19 in the slanting upper part location of a cam shaft 19. Moreover, according to the individual, the 1st and 2nd exhaust side rocker arms 24 and 25 interlock, are connected with both the exhaust valves VE1 and VE2, and are supported free [a splash] by the exhaust side rocker shaft 32 which carried out to said inspired air flow path rocker shaft 31 at parallel, and was supported by holder 26 -- fixed in the slanting upper part location of said cam shaft 19.

[0015] The roller 33 which carries out the rolling contact to the 1st inspired air flow path cam 27 is supported to revolve by the end of the 1st actuation rocker arm 21, while the slide contact section 34 which ****s at the end of the 2nd actuation rocker arm 23 at a ridge 29 narrows width of face corresponding to a ridge 29, it is prepared, and the CAMS rip saw 35 which ****s for the 2nd inspired air flow path cam 28 is formed in the free rocker arm 22. Moreover, the roller 36 which carries out the rolling contact to the exhaust side cams 30 and 30 prepared in the cam shaft 19 is supported to revolve by the end of both the exhaust side rocker arms 24 and 25, respectively.

[0016] The tappet screw thread 37 which contacts the upper bed of both the inlet valves VI1 and VI2 is screwed in the other end of the 1st and 2nd actuation rocker arms 21 and 23 respectively free [an attitude], and each inlet valves VI1 and VI2 will carry out closing motion actuation according to splash actuation of the 1st and 2nd actuation rocker arms 21 and 23. Moreover, the tappet screw thread 38 which contacts the upper bed of each exhaust valves VE1 and VE2 is screwed in the other end of both the exhaust side rocker arms 24 and 25 respectively free [an attitude], and each exhaust valves VE1 and VE2 will carry out closing motion actuation according to splash actuation of both the exhaust side rocker arms 24 and 25.

[0017] By the way, the support plate 39 is constructed between upper beds, and the from-cartridge-energized lost motion device 40 is arranged in the direction of each holder 26 -- which makes the free rocker arm 22 **** for the 2nd inspired air flow path cam 28 of a cam shaft 19 by this support plate 39.

[0018] The connection condition of those rocker arms 21-23 and the deconcatenation condition of those rocker arms 21-23 are prepared in the switchable connection change-over device 41 by the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 according to an engine's operational status.

[0019] This connection change-over device 41 is equipped with the change-over piston 42 fitting of the sliding of is made possible to the 1st actuation rocker arm 21, the 1st connection pin 43 which can connect the 1st actuation rocker arm 21 and the free rocker arm 22, the 2nd connection pin 44 which can connect the free rocker arm 22 and the 2nd actuation rocker arm 23, and the spring 45 ****(ed) between the 2nd connection pin 44 and the 2nd actuation rocker arm 23.

[0020] The 1st guide hole 46 of the owner bottom opened to the free rocker arm 22 side is drilled in the inspired air flow path rocker shaft 31 and parallel by the 1st actuation rocker arm 21, fitting of the sliding of the change-over piston 42 is made possible to it in this 1st guide hole 46, and the oil pressure room 47 is formed between the end of the change-over piston 42, and the lock out edge of the 1st guide hole 46. Moreover, the free passage way 48 which is open for free passage in the oil pressure room 47 is drilled by the 1st driving-side rocker arm 21, and the oilway 49 which is always open for free passage on said free passage way 48 47, i.e., an oil pressure room, is formed irrespective of the splash condition of the 1st actuation rocker arm 21 in the inspired air flow path rocker shaft 31. It **, and this oilway 49 is connected to a hydraulic power unit 51 through the electromagnetic-control valve 50 for a connection change-over, as drawing 1 shows.

[0021] The guide hole 52 corresponding to the 1st guide hole 46 carries out to the inspired air flow path rocker shaft 31 at parallel, and is drilled over the both-sides side by the free rocker arm 22, and fitting of the sliding of the 1st connection pin 43 by which an end is contacted by the other end of said change-over piston 42 is made possible to the guide hole 52.

[0022] In the 2nd actuation rocker arm 23, have step 53a which attends the free rocker arm 22 side while the 2nd guide hole 53 of the owner bottom corresponding to said guide hole 52 opens to the free rocker arm 22 side, and the inspired air flow path rocker shaft 31 and parallel are punctured. The 2nd connection pin 44 of the shape of a closed-end

cylinder which made the end contact the other end of the 1st connection pin 43 may make, as the other end contacts said step 53a, and fitting of the sliding of the 2nd guide hole 53 of it is made possible to it. This 2nd connection pin 44 turns that opening edge to lock out one end of the 2nd guide hole 53, and is arranged, and a spring 45 is ****(ed) between the lock out edge of the 2nd guide hole 53, and the lock out edge of the 2nd connection pin 44. And air and the free passage hole 54 for an oil removing are drilled in the lock out edge of the 2nd guide hole 53.

[0023] In this connection change-over device 41, if oil pressure is made to act on the oil pressure room 47 by the electromagnetic-control valve 50 for a connection change-over, the change-over piston 42 will move to the side which resists the spring force of a spring 45 and increases the volume of the oil pressure room 47, and when the 2nd connection pin 44 contacts step 53a, a migration edge will be regulated. In this condition, the contact side of the change-over piston 42 and the 1st connection pin 43 is located in the location corresponding to between the 1st actuation rocker arm 21 and the free rocker arm 22, and the contact side of the 1st connection pin 43 and the 2nd connection pin 44 is located in the location corresponding to between the free rocker arm 22 and the 2nd actuation rocker arm 23. Therefore, it is in the condition in which relative angular displacement is possible mutually, splash actuation of the 1st actuation rocker arm 21 is carried out by the 1st inspired air flow path cam 27 by revolution actuation of a cam shaft 19, and the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 carry out closing motion actuation of one inlet valve VI 1 in the timing according to a configuration and the amount of lifts of the 1st inspired air flow path cam 27. Moreover, the 2nd actuation rocker arm 23 which ****ed to the ridge 29 can be in hibernation substantially, and can stop the inlet valve VI 2 of another side substantially. And since it operates slightly in the valve-opening direction when an inlet valve VI 2 is not stopped thoroughly but one inlet valve VI 1 opens, fixing to the valve seat of the inlet valve VI 2 produced when a perfect clausilium condition is maintained, and stagnation of a fuel can be prevented. Although splash actuation of the free rocker arm 22 is furthermore carried out by the 2nd inspired air flow path cam 28, no effect also exerts the splash actuation on the 1st and 2nd actuation rocker arms 21 and 23. Moreover, exhaust valves VE1 and VE2 carry out closing motion actuation in the timing according to a configuration and the amount of lifts of the exhaust side cams 30 and 30.

[0024] When the oil pressure of the oil pressure room 47 was released by the electromagnetic-control valve 50 for a connection change-over and the axis of the 1st guide hole 46, the guide hole 52, and the 2nd guide hole 53 is in agreement, according to the spring force of a spring 45, the 2nd connection pin 44 fits into the guide hole 52, pressing the 1st connection pin 43, and the 1st connection pin 43 fits into the 1st guide hole 46, pressing the change-over piston 42. The 1st connection pin 43 will connect the 1st actuation rocker arm 21 and the free rocker arm 22 in the condition that **(ed) and the change-over piston 42 had migration regulated by the lock out edge of the 1st guide hole 46, and the 2nd connection pin 44 will connect the free rocker arm 22 and the 2nd actuation rocker arm 23. By this, the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 will be in a connection condition, the 1st and 2nd actuation rocker arms 21 and 23 rock with the free rocker arm 22 in which splash actuation is carried out by the 2nd inspired air flow path cam 28, and both the inlet valves VI1 and VI2 both carry out closing motion actuation in the timing according to a configuration and the amount of lifts of the 2nd inspired air flow path cam 28. Moreover, both the exhaust side rocker arms 24 and 25 carry out closing motion actuation of both the exhaust valves VE1 and VE2 like the time of a low load in the timing and the amount of lifts according to a configuration of the exhaust side cams 30 and 30.

[0025] Namely, the connection condition of the connection change-over device 41 connecting the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 according to oil pressure release, and carrying out closing motion actuation of both the inlet valves VI1 and VI2, Although the connection condition of the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 is canceled according to an oil pressure operation and closing motion actuation of one inlet valve VI 1 is carried out, the deconcatenation condition of stopping the inlet valve VI 2 of another side substantially is constituted switchable.

[0026] In drawing 1 , the inlet pipe 57 which forms the inhalation-of-air path 56 is again connected to the inhalation-of-air opening edge 8, and a throttle valve 58 is interposed while being this inhalation-of-air path 56. Moreover, in the edge by the side of the cylinder head 2 in an inlet pipe 57, it is the inhalation-of-air opening edge 8 to both the inlet-valves opening 61, and 62. The fuel injection valve 59 which turns and injects a fuel is attached.

[0027] Actuation of said electromagnetic-control valve 50 for a connection change-over for switching the operating state of a moving valve mechanism 18 It is what is controlled by the control means 60 which consists of a computer. To this control means 60 MAP PB as an index representing an engine load The MAP sensor SP and the engine rotational

frequency NE to detect Rotational frequency sensor SN to detect The engine rotational frequency NE detected and engine temperature TW Engine temperature sensor ST to detect It connects, respectively.
[0028] In order to ** and to control actuation of the electromagnetic-control valve 50 for a connection change-over, i.e., change-over actuation of a moving valve mechanism 18 When it explains referring to drawing 5 about the control procedure set up by the control means 60, at the 1st step S1 and the 2nd step S2 MAP PB and engine rotational frequency NE And engine temperature TW the 3rd step S3 after reading -- engine temperature TW whether it is beyond the completion temperature TWref of warming-up (for example, 60 degrees C) judges -- having -- TWref<=TW it was -- sometimes, it progresses at the 4th step S4.
[0029] In the 4th step S4, a search on the map shown by drawing 6 (a) is performed. Namely, engine rotational frequency NE And MAP PB The 2 valve operating space for being based and carrying out closing motion actuation of both the inlet valves VI1 and VI2 of both, Engine rotational frequency NE which the 1 valve operating space which makes the inlet valve VI 2 of another side stop substantially is beforehand set up although closing motion actuation of one inlet valve VI 1 is carried out, and was detected And MAP PB A search based on the map of drawing 6 (a) to twist is performed.
[0030] When it is judged that it is in a 1 valve operating space at the 5th following step S5 Oil pressure is made to act on the oil pressure room 47 of the connection change-over device 41 in a moving valve mechanism 18 in the 6th step S6. Although the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 are made into a deconcatenation condition and closing motion actuation of one inlet valve VI 1 is carried out, it is made to stop the inlet valve VI 2 of another side substantially. Moreover, when it is judged at the 5th step S5 that it is a 2 valve operating space, in the 7th step S7, oil pressure is made to release from the oil pressure room 47 of said connection change-over device 41, the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 are made into a connection condition, and it is made to carry out closing motion actuation of both the inlet valves VI1 and VI2 of both.
[0031] At the 3rd step S3, it is the engine temperature TW. When it is judged that it is under the completion temperature TWref of warming-up (TW <TWref), it progresses to the 8th step S8 from the 3rd step S3. At this 8th step S8, a search on the map shown by drawing 6 (b) is performed. Namely, engine rotational frequency NE And MAP PB Although the 2 valve operating space for being based and carrying out closing motion actuation of both the inlet valves VI1 and VI2 of both and the 1 valve operating space which makes the inlet valve VI 2 of another side stop substantially although closing motion actuation of one inlet valve VI 1 is carried out are set up beforehand the map of drawing 6 (a) in which the 2 valve operating space in the map shown by this drawing 6 (b) is shown with the chain line -- comparing -- a heavy load side -- setting -- engine rotational frequency NE And MAP PB any -- although -- it is expanded and set to the side which becomes low.
[0032] When it is judged by the 9th step S9 that it is in a 1 valve operating space by map retrieval of drawing 6 (b) Progress to the 10th step S10 and oil pressure is made to act on the oil pressure room 47 of the connection change-over device 41 in a moving valve mechanism 18. Although the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 are made into a deconcatenation condition and closing motion actuation of one inlet valve VI 1 is carried out, it is made to stop the inlet valve VI 2 of another side substantially. Moreover, when it is judged that it is a 2 valve operating space in the 9th step S9, progress to the 7th step S7, oil pressure is made to release from the oil pressure room 47 of said connection change-over device 41, the 1st actuation rocker arm 21, the free rocker arm 22, and the 2nd actuation rocker arm 23 are made into a connection condition, and it is made to carry out closing motion actuation of both the inlet valves VI1 and VI2 of both.
[0033] When an operation of this example is explained, next, a control means 60 MAP PB representing an engine load And engine rotational frequency NE Are based, and when [both] it judges that it is in a 2 valve operating space, closing motion actuation of both the inlet valves VI1 and VI2 is carried out. Although actuation of a moving valve mechanism 18 is controlled by the 1 valve operating space to stop the inlet valve VI 2 of another side substantially while carrying out closing motion actuation of one inlet valve VI 1 Engine temperature TW when a swirl style is produced in a combustion chamber 5 and it is made to perform lean combustion by stopping substantially the inlet valve VI 2 of said another side, before warming up is completed In the condition of being low temperature, when especially an engine load is expensive, it originates in stratified charge and a smoke occurs. however, engine temperature TW the condition beyond the completion temperature of warming-up shown by drawing 6 (a) as drawing 6 (b) showed the 2 valve operating space in the condition of under the completion temperature TWref of warming-up --

comparing -- a heavy load side -- setting -- engine rotational frequency NE And MAP PB any -- although -- it is expanded to the side which becomes low. therefore, the thing done in both the condition of under the completion temperature of warming-up for the closing motion actuation of both the inlet valves VI1 and VI2 at the time of the heavy load which performs one valve action which carries out the real pause of the inlet valve VI 2 in the condition beyond the completion temperature of warming-up -- the inside of a combustion chamber 5 -- homogeneity -- gaseous mixture will be formed, generating of a smoke is prevented as much as possible, and, thereby, it can contribute to improvement in engine endurance.

[0034] And it becomes that it is made to stop the inlet valve VI 2 of another side substantially although closing motion actuation of both the inlet valves VI1 and VI2 is carried out according to oil pressure release and closing motion actuation of one inlet valve VI 1 is carried out according to an oil pressure operation, and closing motion actuation of both the inlet valves VI1 and VI2 of both is carried out also in the time of the super-low oil temperature which a problem produces on change-over responsibility, and the connection change-over device 41 can obtain high power.

[0035] As mentioned above, although the example of this invention was explained in full detail, this invention can perform various design changes, without deviating from this invention which is not limited to the above-mentioned example and indicated by the claim.

[0036] For example, a 2 valve operating space and a 1 valve operating space should just be set up based on either [at least] an engine rotational frequency or an engine load. Moreover, although it was made to make it operate in the valve-opening direction slightly in the above-mentioned example when an inlet valve VI 2 was not stopped thoroughly and one inlet valve VI 1 opened, this invention is applicable also about the thing it was made to stop said inlet valve VI 2 thoroughly.

[0037]

[Effect of the Invention] The internal combustion engine which follows invention according to claim 1 as mentioned above Although closing motion actuation of both the inlet valves is carried out in both the 2 valve operating spaces set up based on either [at least] an engine rotational frequency or an engine load, while carrying out closing motion actuation of one inlet valve in 1 valve operating spaces other than said 2 valve operating space It has the control means which controls actuation of a moving valve mechanism as is made to stop the inlet valve of another side substantially. Engine temperature said 2 valve operating space in the condition of under the completion temperature of warming-up Since either [at least] said engine rotational frequency or an engine load is expanded and set to the side which becomes low compared with the condition beyond the completion temperature of warming-up even if it is in the condition of stopping one valve at the time beyond the completion temperature of warming-up, closing motion actuation of the inlet valve of a couple is carried out under at both the completion temperature of warming-up -- making -- making -- homogeneity -- by obtaining gaseous mixture, generating of a smoke can be prevented as much as possible, and it can contribute to improvement in engine endurance.

[0038] According to invention according to claim 2, in the configuration of invention of the claim 1 above-mentioned publication moreover, in addition, a moving valve mechanism Two or more rocker arms containing the actuation rocker arm which it interlocks according to an individual to both inlet valves, and is connected with them, respectively, The connection condition of said rocker arm is canceled according to the connection condition and oil pressure operation which those rocker arms are connected [operation] according to oil pressure release, and carry out closing motion actuation of both the inlet valves. Although closing motion actuation of one inlet valve is carried out, it becomes possible to carry out closing motion actuation of both the inlet valves of both, and to obtain high power also in the time of the super-low oil temperature from which it has a switchable connection change-over device, and a problem produces the deconcatenation condition of stopping the inlet valve of another side substantially, on change-over responsibility.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is a whole block diagram.
[Drawing 2] It is the enlarged vertical longitudinal sectional view showing a moving valve mechanism.
[Drawing 3] It is 3-3 line view drawing of drawing 2 .
[Drawing 4] It is the 4-4 line sectional view of drawing 3 .
[Drawing 5] It is the flow chart which shows the control procedure of a moving valve mechanism.
[Drawing 6] It is drawing showing a valve operating-space map.
[Description of Notations]
18 ... Moving valve mechanism
21, 22, 23 ... Rocker arm
41 ... Connection change-over device
60 ... Control means
VI1, VI2 ... Inlet valve

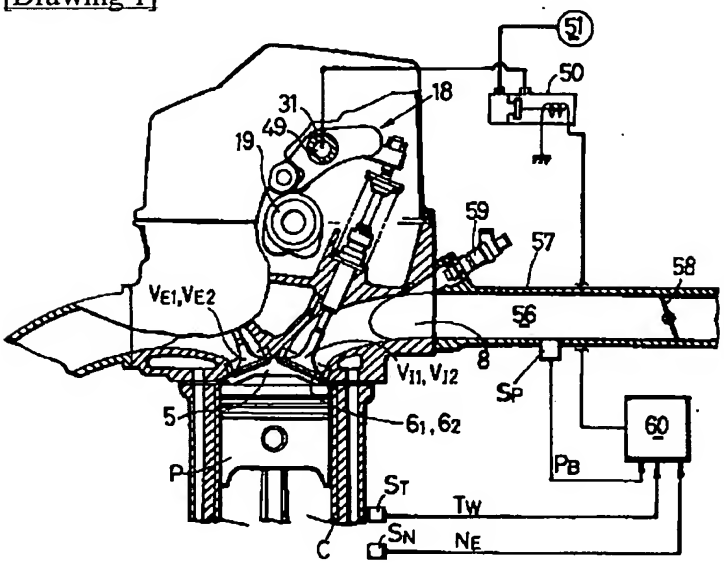
[Translation done.]

* NOTICES *

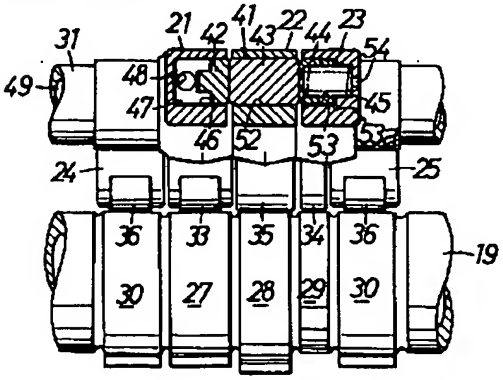
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

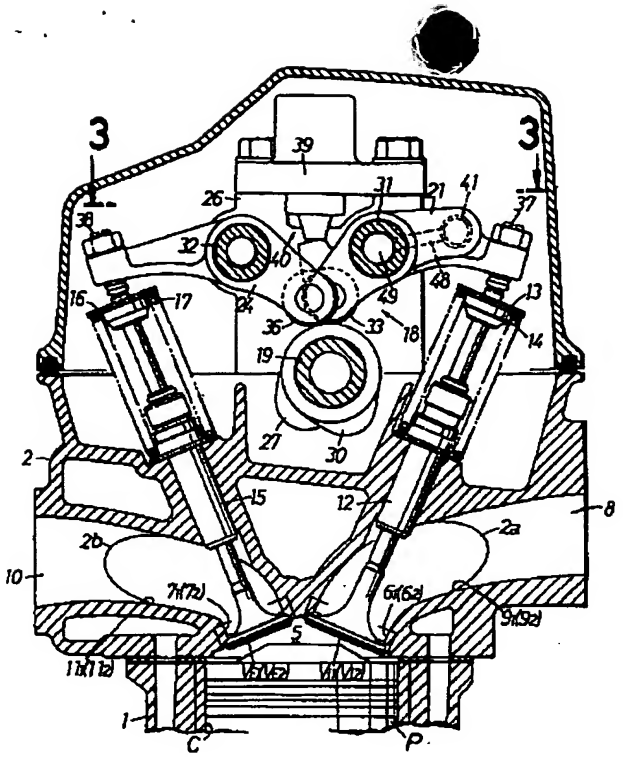
[Drawing 1]



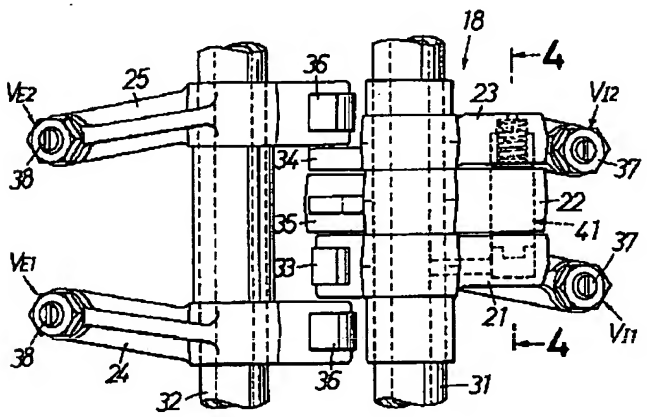
[Drawing 4]



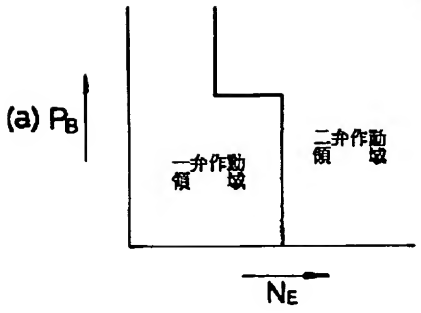
[Drawing 2]

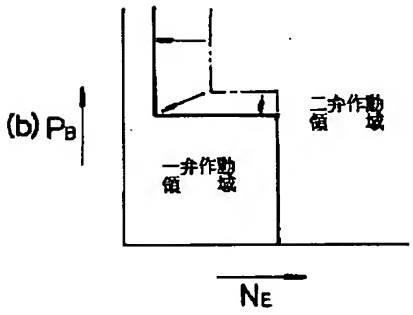


[Drawing 3]

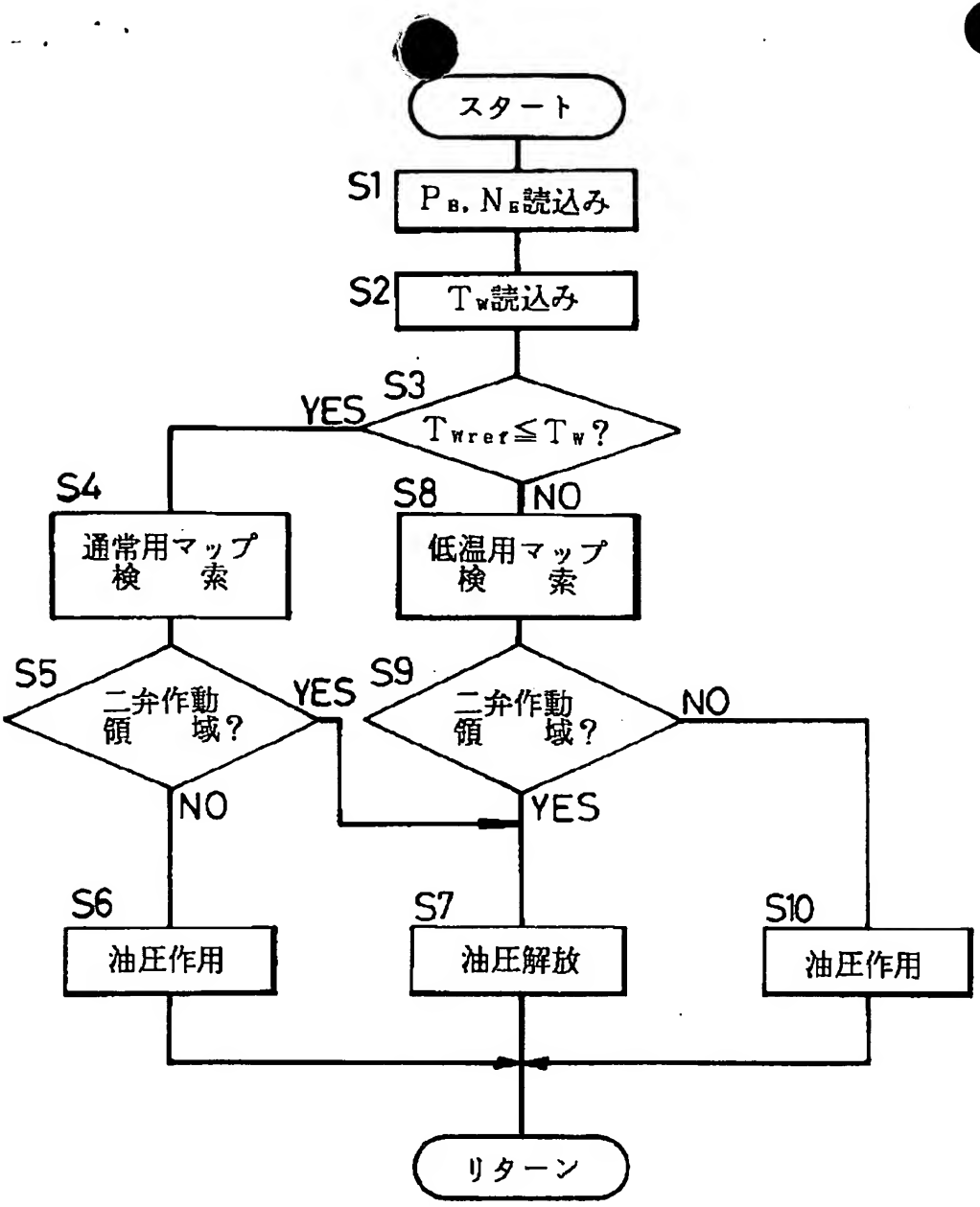


[Drawing 6]





[Drawing 5]



[Translation done.]